We Claim:

Sub B17

317

1. An optical device comprising a glass substrate doped with a laser species and having two or more waveguides defined by channels in the substrate having a distinct refractive index from the substrate wherein at least two of the waveguides are defined by channels having differing widths such that they have distinct effective refractive indices from each other.

2. An optical device of claim 1, wherein the substrate is comprised of an alkali phosphate glass doped with Er and Yb.

3. An optical device of claim 2, wherein the waveguides are comprised of an alkali phosphate glass doped with Er and Yb, which has been treated so that the refractive index is higher than that of the substrate.

4. An optical device of claim 3, wherein the optical device is prepared by applying a mask to the substrate glass having apertures of a width and length corresponding to the waveguides to be formed in the substrate and conducting ion-exchange by contact with an ion-exchange solvent to form the waveguides through the apertures.

5. An optical device of claim 3, wherein the optical device is prepared by applying a mask to the substrate glass having apertures of a width and length corresponding to the waveguides to be formed in the substrate and conducting photolithography to form the waveguides through the apertures.

6. An optical device of claim 1, which further comprises a reflecting element in association with the waveguide to provide a laser effect when pumped.

7. The optical device of claim 6, wherein the reflecting element is a diffraction grating provided on the substrate.

8. A method for preparing an optical device having at least one active doped region substrate, at least one passive doped region substrate and at least one waveguide defined therein which comprises bringing a separate active doped substrate and a separate passive doped substrate in contact with each other and heating at a temperature above the softening temperature of the substrates to fuse them together, the waveguide being provided either before or after fusing the substrates.

9. An optical device having at least one active doped region substrate, at least one passive doped region substrate and at least one waveguide defined therein which is prepared by the process of claim 8.

10. An optical device of claim 9, wherein at least one region of the substrate is comprised of an alkali phosphate glass doped with Er and Yb.

11. An optical device of claim 9, which is a laser comprising the fused active doped region and passive doped region substrate and at least one waveguide defined therein.

12. A method for modifying the wavelength of one or more waveguides contained as channels of differing refractive index material in a laser species-containing substrate which comprises heating the substrate.

13. The method of claim 12, wherein the method results in expansion the waveguide(s) to increase the wavelength which is offset by a reduction in the refractive index of the waveguide.

14. The method of claim 12, wherein the modifying of the wavelength upon heating occurs at a rate which is about 15 times less than that observed for DFB lasers.

15. The method of claim 12, wherein the substrate is comprised of an alkali phosphate glass doped with Er and Yb.